Energy levels of the (one electron) hydrogen atom

$$E = \frac{-Rhc}{n^2}$$

$$\Delta E = E_f - E_i = \left(\frac{-Rhc}{n_f^2}\right) - \left(\frac{-Rhc}{n_i^2}\right) = -Rhc\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

$$\Delta E = h\nu = \frac{\cancel{hc}}{\lambda} = -R\cancel{hc}\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

$$\frac{1}{\lambda} = -R\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

Energy levels of the (one electron) hydrogen atom

$$\frac{1}{\lambda} = -R\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

Calculate wavelength (in nm) of the n=4 to n=2 transition of the hydrogen atom

$$\lambda = \frac{1}{-R\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)} = \frac{1}{-(1.097x10^7\ m^{-1})\left(\frac{1}{2^2} - \frac{1}{4^2}\right)} = 4.86x10^{-7}m$$

$$\lambda = 4.86x10^{-7}m\left(\frac{10^9 nm}{m}\right) = 486nm$$

Wavelength of a 110 MPH baseball

$$\lambda = \frac{h}{mv} = \frac{6.6x10^{-34} J \cdot s}{(114g)(110\ miles \cdot hr^{-1})} \frac{kg \cdot m^2}{J \cdot s^2} \frac{mile}{1609m} \frac{60\min}{hr} \frac{60s}{\min} \frac{10^3 g}{kg}$$

$$J = \frac{kg \cdot m^2}{s^2}$$

$$1 = \frac{kg \cdot m^2}{J \cdot s^2}$$

$$1\ mile = 1609m$$

$$1 = \frac{mile}{1609m}$$

$$1\min = 60\sec$$

$$1 = \frac{60\sec}{\min}$$

$$kg = 10^3 g$$

$$1 = \frac{10^3 g}{kg}$$

$$1\ hr = 60\min$$

$$1 = \frac{60\min}{hr}$$

$$\lambda = 1.2x10^{-34} m$$